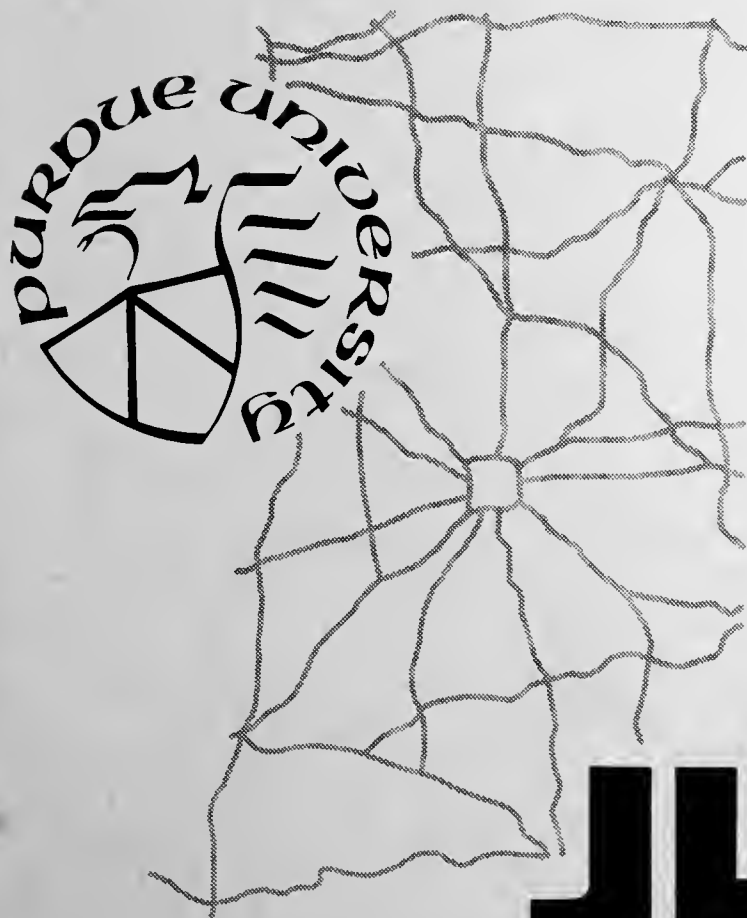


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HERBICIDE STUDIES IN LANDSCAPE PLANTINGS

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BY

P. L. CARPENTER

JHRP

JOINT HIGHWAY RESEARCH PROJECT

PURDUE UNIVERSITY AND
INDIANA STATE HIGHWAY COMMISSION



Interim Report

HERBICIDE STUDIES IN LANDSCAPE PLANTINGS

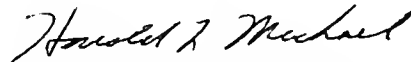
TO: J. F. McLaughlin, Director May 16, 1972
Joint Highway Research Project
Project: C-36-48C
FROM: H. L. Michael, Associate Director
Joint Highway Research Project File: 9-5-3

The attached Interim Report titled "Herbicide Studies in Landscape Plantings" is submitted on Part II of the HPR Part II Research Study "Research in Roadside Development and Maintenance". Professor P. L. Carpenter, principal investigator on this portion, has authored this report.

The report includes a number of recommendations for consideration by highway personnel in managing the roadside through use of herbicides in landscape plantings.

The Report is presented for acceptance as partial fulfillment of the objectives of the referenced research study and will also be forwarded for review, comment and similar acceptance to the ISHC and FHWA.

Respectfully submitted,



Harold L. Michael
Associate Director

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Interim Report
HERBICIDE STUDIES IN LANDSCAPE PLANTINGS

by

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Joint Highway Research Project

Project No.: C-36-48C

File No.: 9-5-3

Prepared as Part of an Investigation

Conducted by

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Engineering Experiment Station
Purdue University

In cooperation with the
Indiana State Highway Commission
and the

U.S. Department of Transportation
Federal Highway Administration

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the Federal Highway Administration.

Purdue University
Lafayette, Indiana
May 16, 1972

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HERBICIDE STUDIES IN LANDSCAPE PLANTINGS

INTRODUCTION

The landscape planting poses several difficult problems when considering the use of herbicides. First, the plantings to be covered are often irregular shaped and accurate determination of the area involved is difficult. Also, the areas are often times small and accurate application of small amounts of herbicides is difficult, if not impossible, with present day equipment.

Due to the usual close proximity of turf to the landscape planting, the problem of herbicide usage is further compounded. Many herbicides that can be used on woody ornamentals will damage turf. Not only is it important to keep the herbicide off of the surrounding turf during application, but also, there must be no lateral movement of herbicide from the landscape bed to the turf area after application is made.

Finally, many plantings contain such a wide range of plant material it is often times difficult to find an effective herbicide that is labeled for all the plants.

The physical problems of accurate application of herbicides to landscape reported plantings have been partially solved in the results of pervious research reported in JHRP progress reports by Lanphear and Spangler. Those studies have shown that certain herbicides can be mixed on a volume basis with mulches. The mulch-herbicide mixture is then applied on a depth basis to the landscape

bed. Weed control using dichlobenil as the herbicide was very good, and lateral movement of the herbicide was reduced. The only way the herbicide can move from the bed is by the actual movement of the bark mulches onto the turf area. The use of bark mulches plus dichlobenil is recommended for highway landscape plantings provided the plants involved are listed on the dichlobenil label.

The use of bark mulch is not always feasible either from a use point of view or for financial reasons. For these reasons other carriers of herbicides for landscape plantings as well as spraying the herbicides on a water-degradable, cellulose blanket which was then applied to the landscape bed. The blanket was covered with a plastic net which broke down by the end of the summer. These methods were compared to the bark mulch method developed by Lanphear.

Also, often weeds become established in highway plantings before pre-emergence herbicide can be used by itself or in mulches. It may be desirable to knock down the existing weed growth with a contact herbicide. The feasibility of using a pre-emergence herbicide with the contact herbicide to reduce the amount of weed regrowth was investigated.

This progress report supplements work reported in previous progress reports filed by Landphear and Spangler.

MATERIALS AND METHODS

The test plots were set up in the Fort Wayne area in various landscape situations. Applications of treatments were made on April 23 and April 30. The plots were cleaned before treatment application. The blankets were sprayed in Lafayette and wrapped in plastic to prevent volatilization of the herbicides. The blankets were precut to the 4' X 5' plot size, and were fastened down in the landscape planting with 6" to 8" wire staples. The herbicides were mixed in the bark and the sand treatments in Lafayette, bagged in burlap bags, and transported to Fort Wayne for application. The sand was applied $\frac{1}{2}$ " in depth and the bark mulch was 2" deep. The three herbicides used were dichlobenil 4 lb/A, trifluralin 2 lb/A, and simazine 1 lb/A plus diphenamid 4 lb/A. All treatments were replicated three times at two different sites. Weed counts were taken at three times during the summer.

On the 23rd of July, five herbicide combinations were applied to a block of silver maple with established, actively growing weeds. In this experiment a contact herbicide was needed to kill the weeds already established. Pre-emergence herbicides were used in combination with the contact killers to prevent the development of new weed growth. The herbicides were applied with a knapsack sprayer. Paraquat was one of the contact killers used and a second application on August 8 was required.

RESULTS AND DISCUSSION

Landscape plantings

It can be seen in Table 1 that the best weed control was obtained using the bark mulch with dichlobenil (Treatment 11). Dichlobenil mixed in sand provided nearly as satisfactory control (Treatment 3). The blanket treated with dichlobenil also provided satisfactory control of weeds (Treatment 7). At one site it was extremely windy on the day of application and some of the dichlobenil may have volatilized before the blankets could be properly applied. All other herbicides except the simazine-diphenamid combination applied to the blanket did not give satisfactory weed control. Table 1 presents the total weed counts for all six treatments.

From a commercial point of view the use of sand as a carrier is not practical due to the weight factor. Also, trying to apply sand to a depth $\frac{1}{2}$ " is difficult due to the uneven soil surface. The blanket when broken down by water is unattractive and the plastic net lasts too long.

The bark mulch alone greatly reduced annual weed growth. However, if perennial weeds were a problem the bark mulch did not prevent their development of growth. In a landscape planting 2 inch bark mulch plus herbicide treatments were applied on May 21. The techniques of mixing the herbicides in the bark mulch were the same as described in the previous experiment. Bindweed counts were taken on July 19 and September 17. The number of bindweed

Table 1

Comparison of Weed Control With Three
Herbicides Applied With Three Carriers

Treatments	Broadleafs on			Grasses on		
	June 19	July 30	Sept 17	June 19	July 30	Sept 17
1. Control	889	273	259	106	57	20
2. Sand $\frac{1}{2}$ "	634	140	203	134	38	14
3. Sand + dichlobenil 4#/A	2	6	34	0	0	0
4. Sand + trifluralin 2#/A	431	84	72	38	14	4
5. Sand + samazine 1#/A + diphenamid 4#/A	153	41	67	14	12	10
6. Blanket	254	340	292	32	75	29
7. Blanket + dichlobenil 4#/A	17	49	67	14	12	14
8. Blanket + trifluralin 2#/A	42	128	166	0	14	19
9. Blanket + simazine 1#/A + diphenamid 4#/A	0	19	98	7	21	13
10. Bark Mulch 2"	33	14	12	17	20	11
11. Bark + dichlobenil 4#/A	0	0	1	0	0	0
12. Bark + trifluralin 2#/A	32	39	25	1	1	1
13. Bark + simazine 1#/A + diphenamid 4#/A	15	19	16	1	8	2

present is reported in Table 2.

It is evident that only dichlobenil is effective in controlling bindweed in landscape plantings for an entire season. The bark mulch alone and the other herbicides used with the bark mulch did not provide lasting bindweed control.

A fall application and a spring application of dichlobenil mixed in bark mulch were applied to an area heavily infested with established bindweed. The same techniques previously described were used for weed counts and application depths. The rate of dichlobenil was increased to 8 lb/A. The bindweed was counted on June 11 and the results are given in Table 3.

The results indicate that a late fall application of bark mulch plus dichlobenil 8 lb/A. will satisfactorily control bindweed. Dichlobenil 8 lb/A. alone reduces bindweed; however, the mulch alone does not.

Quack grass in the landscape situation is another problem. The treatments listed in Table 4 were applied in the same manner as those listed in Table 1. The cellulose blanket was not used at this site. The amount of quack grass present on June 19 and July 30 is given in Table 4. Though most herbicides reduce quack grass only dichlobenil was effective in providing lasting control. It should be noted that complete control was not obtained with any material.

Established Weeds In Shade Trees

After application of treatments at the end of July weed counts were made on October 10. In Table 5 it can be seen that three treatments gave good weed control. These were Paraquat $\frac{1}{2}$ lb/A. plus

Table 2
Control of Field Bindweed With
Three Herbicides Mixed in Bark Mulch

Treatment	Bindweed on	
	June 19	Sept. 17
1. Control	30	30
2. Bark Mulch--2"	27	36
3. Bark + dichlobenil 4#/A	0	4
4. Bark + trifluralin 2#/A	1	36
5. Bark + simazine 1#/A	1	36
6. Bark + diphenamid 6#/A	12	33

Table 3
Control Bindweed Using Dichlobenil
in the Landscape Planting

Treatment	Applied on	
	Nov. 16	April 16
Control	212	160
dichlobenil 8#/A	11	29
Bark Mulch 2" + dichlobenil 8#/A	3	0
Bark Mulch 2"	220	202

Totals from three 2' X 8' plots per treatment.

simazine 3 lb/A, Paraquat $\frac{1}{2}$ lb/A. plus Simazine 1 lb/A and diphenamid 4 lb/A, and Amizine 6 lb/A. Paraquat is a contact herbicide that kills green portions of the plant. It is not selective and must be kept off the green portions of the plants that are not to be killed. It is not translocated in the plant. Amazine is a combination of amitrole and simazine. Amitrole is a contact herbicide that is translocated in the plant. Therefore, Amazine can kill the entire plant even though it only comes in contact with a portion of the plant. It is also non-selective. The weed counts are given in Table 5.

It is apparent that Paraquat will "knock down" weeds to soil level and simazine 3 lb/A or simazine 1 lb/A plus diphenamid 4 lb/A will prevent the return of weed growth. These treatments show promise for controlling established weeds around shade trees on the roadside. Paraquat apparently will be safer to the plant to use than Amizine since it is not translocated. Paraquat alone is only a chemical hoe and weed growth soon develops anew after its use. It cannot be used on any plants such as shrubs where it will be in contact with the green portion of the plants.

Table 4
Quack Grass in the Landscape Planting

Treatment	Grass on	
	June 19	July 30
1. Control	41	125
2. Sand $\frac{1}{2}$ "	56	63
3. Sand + dichlobenil 4#/A	1	4
4. Sand + trifluralin 2#/A	17	28
5. Sand + Simazine 1#/A + Diphenamid 4#/A	17	47
6. Bark Mulch 2"	31	46
7. Bark + dichlobenil 4#/A	2	15
8. Bark + trifluracin 2#/A	34	87
9. Bark + Simazine 1#/A + Diphenamid 4#/A	54	46

Table 5
Control Established Weeds in
2" to 3" Silver Maples

Treatments	Weeds on Oct. 10	
	Broadleaf	Grass
1. Control	211	52
2. * Paraquat $\frac{1}{2}\#/\text{A}$ + simazine $3\#/\text{A}$	9	30
3. * Paraquat $\frac{1}{2}\#/\text{A}$ + simazine $1\#/\text{A}$ + diphenamid $4\#/\text{A}$	20	28
4. * Paraquat $\frac{1}{2}\#/\text{A}$	89	230
5. Diphenamid--dinitro 2 gallon/A	169	140
6. Amizine $6\#/\text{A}$	9	21

* A second application of Paraquat was made on August 8.
Rate was $\frac{1}{2}\#/\text{A}$

SUMMARY

The problems unique with controlling weeds in highway landscape plantings have been partially solved. The following recommendations can be made for consideration by highway management personnel.

1. A bark mulch with dichlobenil 4 lb/A incorporated will provide satisfactory control of weeds in landscape plantings.
2. Use this mulch-herbicide combination only on those plants listed on the dichlobenil label.
3. Further work needs to be done on other methods of applying herbicides to landscape plantings. Sand and the cellulose blanket used as carriers are not satisfactory.
4. Paraquat can be used to reduce or "knock down" established weed growth in shade trees and areas where the green portions of the crop plant will not be in contact with the herbicide.
5. Combinations of herbicides using Paraquat and pre-emergence materials will provide one season weed control.
6. Paraquat is hazardous to use and safety precautions should be followed. (See appendix)

APPENDIX

TOXICITY OF PARAQUAT

Due to some recent fatal poisonings from Paraquat, it is suggested that the following precautions be taken when using the material :

1. Do not store in any unlabeled container; store only in original container.
2. Store out of reach of children and away from foods.
3. Avoid any skin or eye contact.
4. Wear protective clothing when handling and applying Paraquat, including gloves, face shield or other eye protectors, and a protective device to prevent inhaling of fumes and drift.
5. Avoid exposures to drifts and fumes.
6. Train personnel before permitting their use of Paraquat.
7. Do not smoke, drink, or eat in areas where Paraquat is being used.
8. Wash protective clothing after use.
9. Wash thoroughly after use.

Several fatalities have resulted when Paraquat has been consumed accidentally. Permanent damage to eyes and lungs has resulted when not used properly. The damage is permanent. There are no known antidotes so be very careful.

